

Overview On Vetiver Technology Application in Indonesia: Cases studies: West Java, East Java, East Kalimantan, and Papua

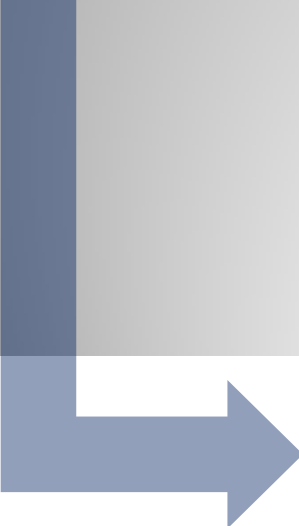
International Workshop on Vetiver System
4 – 5 October 2011



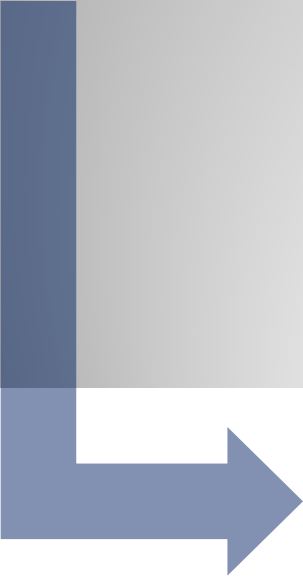
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B A D A N P E N E L I T I A N D A N P E N G E M B A N G A N
P U S A T P E N E L I T I A N D A N P E N G E M B A N G A N J A L A N D A N J E M B A T A N

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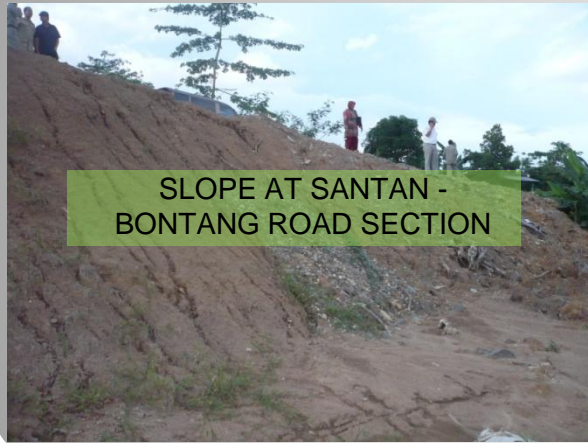
BACKGROUND

- 
- 45% OF INDONESIA AREA IS MOUNTAINOUS AND SENSITIVE TO LANDSLIDES AND EROSION
 - EROSION CAUSED BY NATURAL FACTORS (SLOPE, RAINFALL, GEOLOGICAL), AND HUMAN FACTORS
 - GLOBAL WARMING AND CLIMATE CHANGE PHENOMENON CHALLENGE PUBLIC WORKS INFRASTRUCTURE DEVELOPMENT ON EROSION AND LANDSLIDE DISASTER.

BACKGROUND

- 
- POLICY ON IMPLEMENTATION OF GREEN CONSTRUCTION BY HARMONIZE INFRASTRUCTURE AND BUILDING IN A WIDER NETWORK AND SCOPE, RELATED TO CLIMATE, NATURAL RESOURCES, ECONOMIC, SOCIAL AND CULTURE ASPECTS.
 - VETIVER SYSTEM IS A GREEN CONSTRUCTION TECHNOLOGY
 - UNIQUE CHARACTERISTICS OF VETIVER GRASS ARE DEEP ROOT (5M), PLANT DISEASE RESISTANT, SURVIVE IN ROCKY SOIL WITH HIGH ACIDITY LEVEL.

EROSION/LANDSLIDE PROBLEMS IN INDONESIA



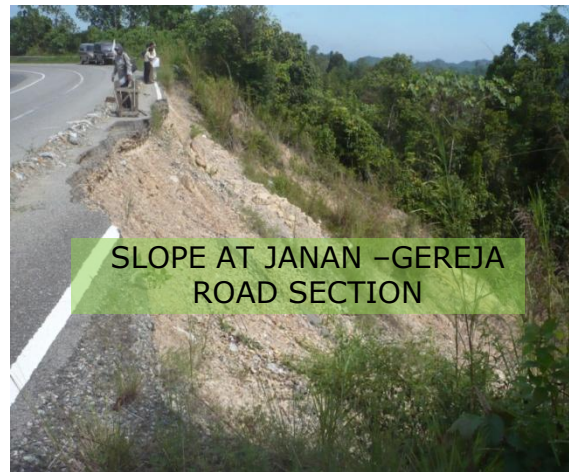
SLOPE AT SANTAN -
BONTANG ROAD SECTION



SLOPE AT SURABAYA-
MADURA ROAD SECTION



SLOPE AT YETTI – ARSO,
PAPUA ROAD SECTION



SLOPE AT JANAN – GEREJA
ROAD SECTION

GIVE IMPACT TO:

- INFRASTRUCTURE
- HUMAN, AND
- ECONOMIC ASPECT

EROSION

**MOSTLY HAPPENED
IN INDONESIAN
ROAD SLOPE**

LOSSES

- SAFETY
- COMFORT
- ENVIRONMENT

**TECHNOLOGY
IS NEEDED**

**VEGETASION/
VETIVER GRASS**

**ENVIRONMENTAL
FRIENDLY**

**APPLI
CABLE**

EASY TO USE

LOW COST

MECHANICAL

CHEMICAL

VETIVER GRASS TECHNOLOGY APPLICATION BY Institute of Road Engineering (IRE)

SMALL SCALE LABORATORY

- SEED AND SOIL TYPES TRIAL
- ROOT GROWTH TRIAL
- VETIVER GRASS SEEDING AT IRE

FIELD LABORATORY

- NAGREG ROAD SECTION, JAWA BARAT (2008)
- CIPULARANG TOLL ROAD KM 95 DAN KM 100 ROAD SECTION, WEST JAVA (2009)

FULL LABORATORY

- SURABAYA – MADURA BRIDGE, EAST SECTION, EAST JAVA (2010)
- BALIKPAPAN – SAMARINDA, LOA JANAN – GEREJA ROAD SECTION, EAST KALIMANTAN (2010)
- ARSO – YETTI ROAD SECTION, PAPUA (2010)

SMALL SCALE LABORATORY EXPERIMENT AT IRE



SEED AND SOIL TYPES
TRIAL



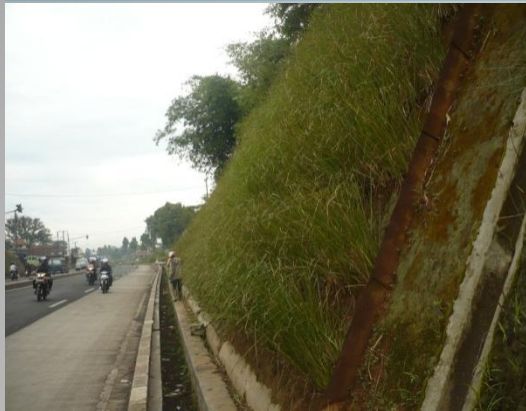
SLOPE 45°,
GRASS, PLACEMENT VARIATION ,
SILTY LAY LOAM



ROOT GROWTH TRIAL

SOURCE: IRE, 2009 – 2010

FIELD LABORATORY AT NAGREG KM 43 – WEST JAVA



SLOPE 80°,
AGE: 4 MONTHS
BEFORE TRIMMING



SLOPE 80°,
AGE: 4 MONTHS
AFTER TRIMMING

SOIL TYPE: CLAY,
SLOPE HEIGHT VARIATION
(7M)
SLOPE LENGTH
(5M/TREATMENT)

SOURCE: IRE, 2009 – 2010

Penurunan Tingkat Erosi untuk Masing-masing Perlakuan Lokasi Nagreg KM 43 – Kabupaten Bandung

Pola Penanaman	Reduksi Laju Erosi (%)
Rumput Vetiver (V)	77,4
Rumput Bahia (B)	91,8
Kombinasi Rumput Vetiver : Bhaia (V1B2)	99,2
Kombinasi Rumput Vetiver : Bahia (V2B1)	99,3

FIELD LABORATORY AT CIPULARANG TOLL ROAD, KM 95 ROAD SECTION, WEST JAVA



SLOPE 60°,
AGE: 3 MONTHS



SLOPE 30°,
AGE: 3 MONTHS



SLOPE 45°,
AGE: 3 MONTHS

SOIL TYPE: SILTY CLAY,
SLOPE HEIGHT VARIATION (3, 6, 9 M)
SLOPE LENGTH(5M/TREATMENT)

SOURCE: IRE, 2009 – 2010

FIELD LABORATORY AT CIPULARANG TOLL ROAD, KM 100 +200 ROAD SECTION, WEST JAVA



SLOPE 60°,
AGE: 3 MONTHS



SLOPE 30°,
AGE: 3 MONTHS



SLOPE 45°,
AGE: 3 MONTHS

SOIL TYPE: DUSTY CLAY
SLOPE HEIGHT VARIATION (3, 6, 9 M)
SLOPE LENGTH(5M/TREATMENT),
STABILITY INDEX: UNSTABLE

SOURCE: IRE, 2009 – 2010

CORELATION AMONG EROSION, RAINFALL INTENCITY, AND VETIVER GRASS COVERED AT CIPULARANG TOLL ROAD

No.	Model	Persamaan	R ²	Sig
1	PE30 - L3	107,310 – 4,071(I) + 0,170(P)	0,941	0,015
2.	PE30 - L6	107,389 – 4,293(I) + 0,194(P)	0,907	0,028
3.	PE30 - L9	105,916 – 3,830(I) + 0,679(P)	0,899	0,032
4.	PE45 - L3	100,158 – 5,139(I) + 0,458(P)	0,888	0,033
5.	PE45 - L6	97,547 – 5,080(I) + 0,539(P)	0,892	0,035
6.	PE45 - L9	96,814 – 5,172(I) + 0,572(P)	0,894	0,034
7.	PE60 - L3	89,906 – 6,561(I) + 1,012(P)	0,902	0,031
8.	PE60 - L6	89,805 – 6,441(I) + 0,946(P)	0,890	0,031
9.	PE60 - L9	89,450 – 6,379(I) + 0,952(P)	0,905	0,029

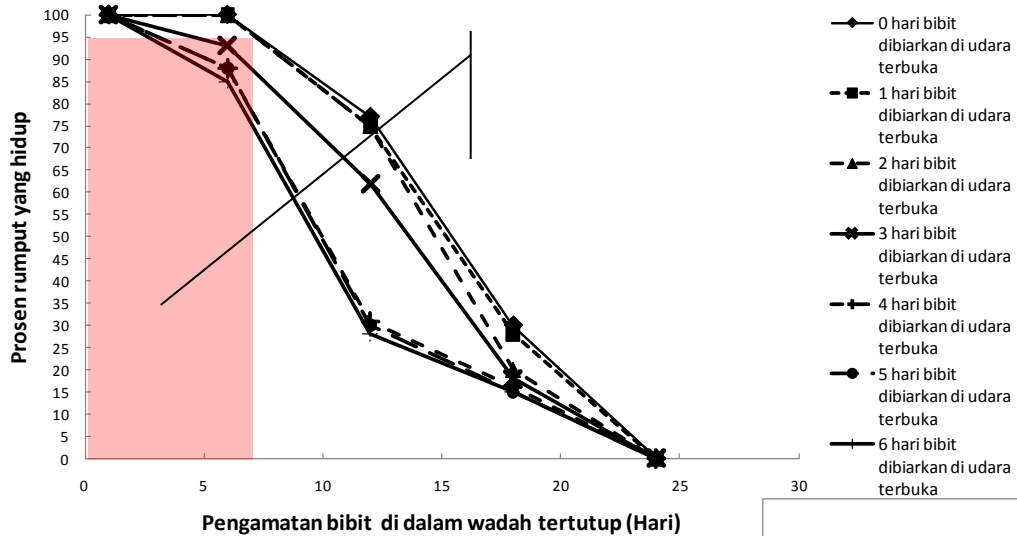
95+200 ROAD SECTION

100+200 ROAD SECTION

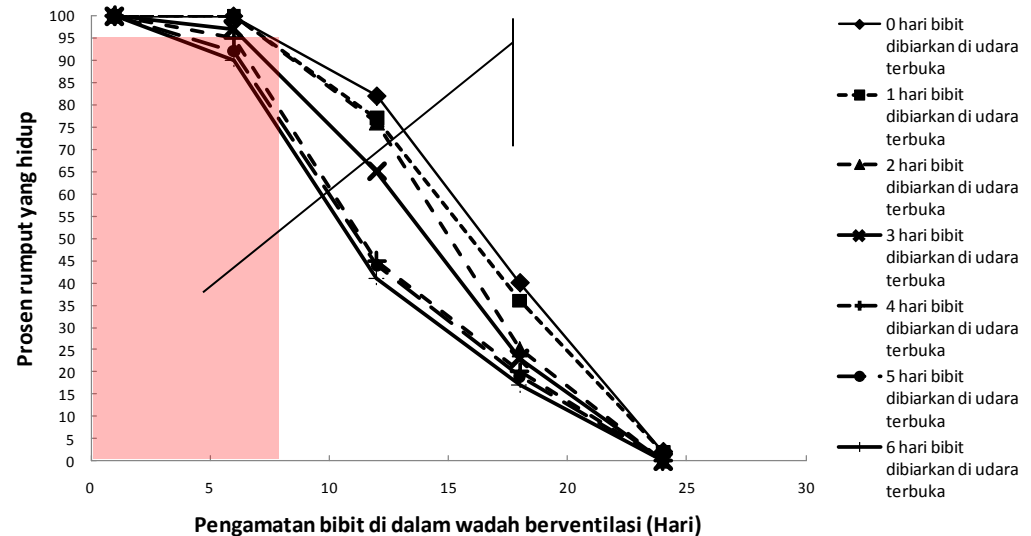
No.	Model	Persamaan	R ²	Sig
1	PE30 - L3	82,71 – 4,108(I) + 0,667(P)	0,875	0,016
2.	PE30 - L6	81,71 – 4,061(I) + 0,687(P)	0,868	0,017
3.	PE30 - L9	84,12 – 4,528(I) + 0,665(P)	0,871	0,017
4.	PE45 - L3	76,55 – 5,112(I) + 0,837(P)	0,902	0,010
5.	PE45 - L6	76,24 – 5,128(I) + 0,839(P)	0,905	0,009
6.	PE45 - L9	75,74 – 5,130(I) + 0,851(P)	0,904	0,009

SOURCE: IRE, 2009 – 2010

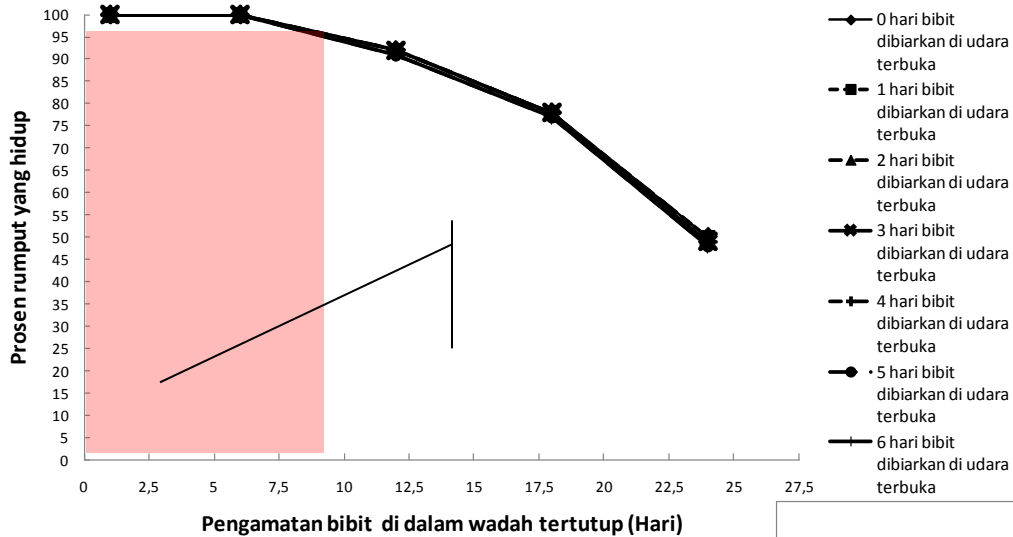
VETIVER SEEDS SIMULATION FOR TRANSFERING



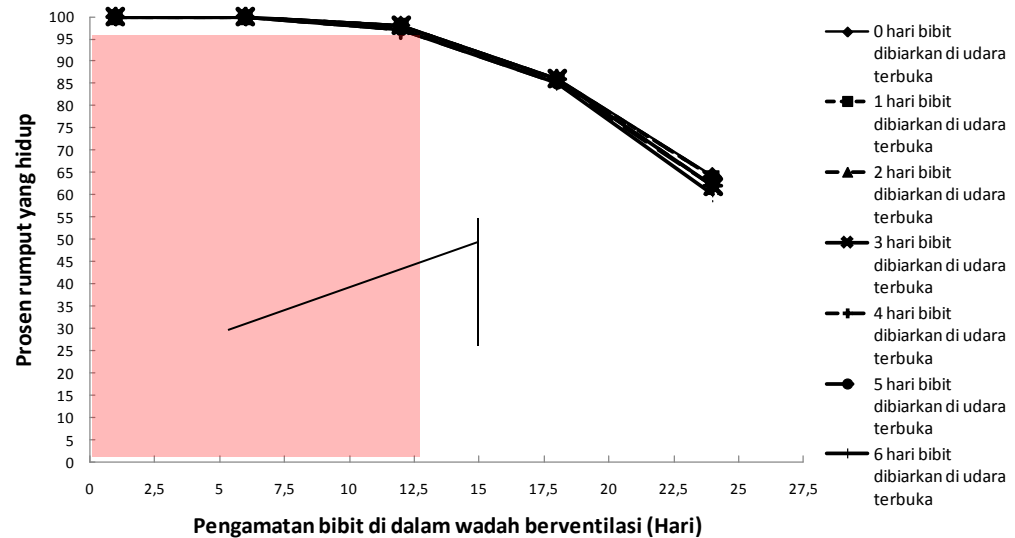
SLIPS BIBIT



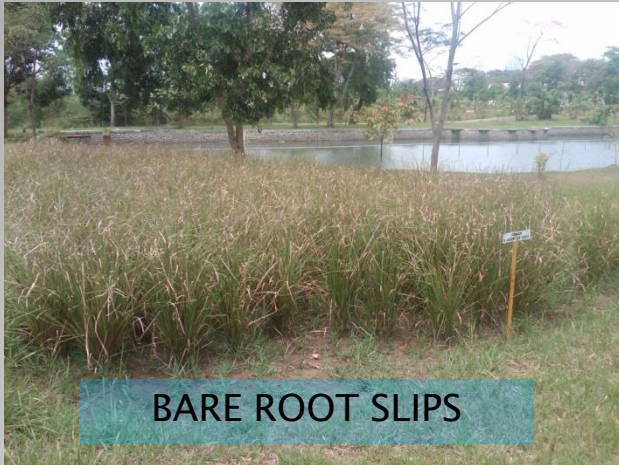
VETIVER SEEDS SIMULATION FOR TRANSFERING



BIBIT DALAM POLIBAGS



VETIVER GRASS NURSERY



BARE ROOT SLIPS



POLIBAG

AT PUSJATAN CAMPUS



POLIBAG

AT SAMARINDA



POLIBAG

AT SURABAYA

SOURCE: IRE, 2009 – 2010

FULL SCALE TRIAL AT SURABAYA – MADURA ROAD SECTION, EAST JAVA



BEFORE(EKSISTING)



1 MONTH



REGULAR CUTTING
(TRIMMING) AFTER 4
MONTH



WITH VETIVER
TECHNOLOGY,
AGE 2,5 MONTHS

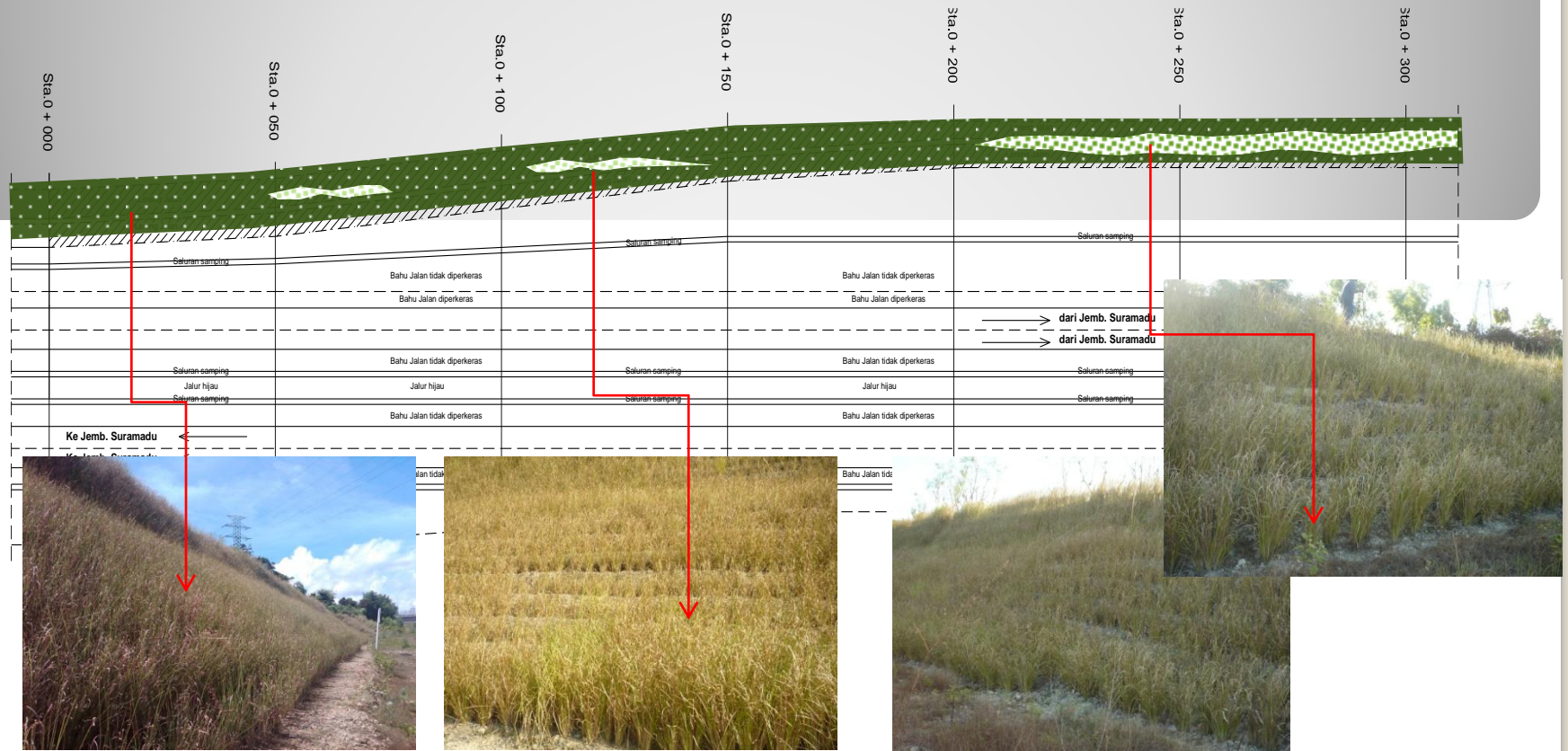


4 MONTH

SLOPE LENGTH: 300 M, HEIGHT: 14 M,
GRANULAR: GRANULE

SOURCE: IRE, 2009 – 2010

VERTIVER GRASS MONITORING AT SURABAYA – MADURA ROAD SECTION, EAST JAVA



FULL SCALE TRIAL AT LOA JANAN – GEREJA ROAD SECTION, EAST KALIMANTAN



BEFORE (EKSISTING)



1 MONTH



REGULAR CUTTING
(TRIMMING) AFTER 4
MONTH



WITH VETIVER
TECHNOLOGY,
AGE: 2 MONTHS

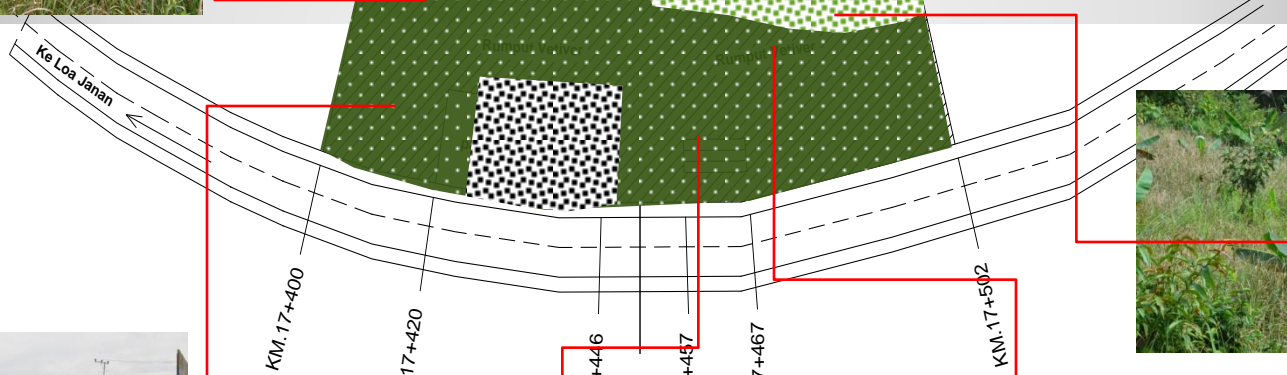


4 MONTH

SLOPE LENGTH: 100 M, HEIGHT: 34 M,
GRANULAR: KERSAI/GRANULE

SOURCE: IRE, 2009 – 2010

VETIVER GRASSGROWTH MONITORING AT LOA JANAN – GEREJA ROAD SECTION, EAST KALIMANTAN



FULL SCALE TRIAL AT YETTI - ARSO ROAD SECTION, PAPUA



BEFORE (EKSISTING)



1 MONTH



4 MONTH

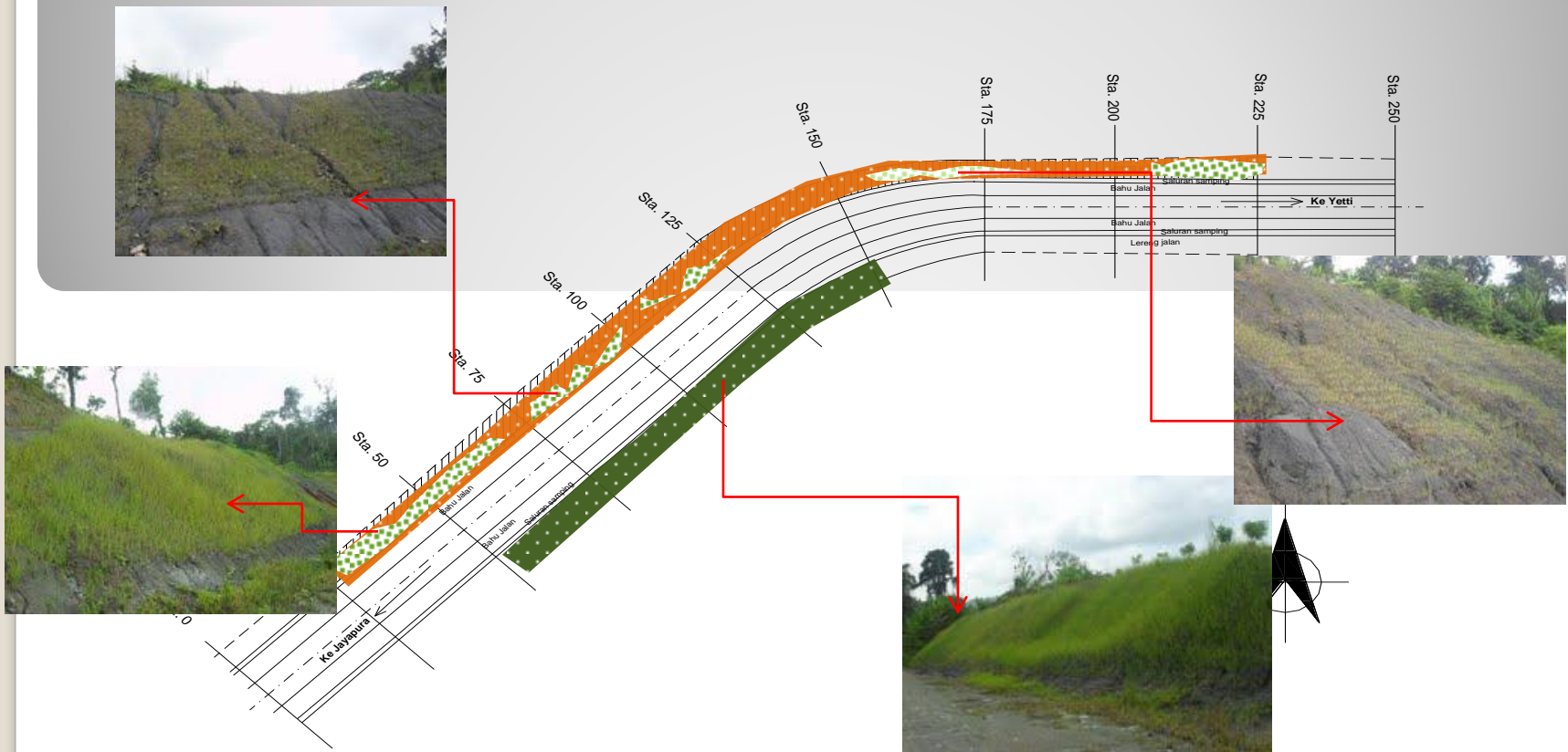


WITH VETIVER
TECHNOLOGY
AGE: 1.5 MONTHS

SLOPE LENGTH: 300 M, HEIGHT: 12 M,
STRUCTURELESS/MASSIVE

SOURCE: IRE, 2009 – 2010

VETIVER GRASS MONITORING AT YETTI - ARSO ROAD SECTION, PAPUA



DENAH LOKASI

Skala 1 : 1000

PROBLEMS

LESS MAINTENANCE
STUDY CASES: CIPULARANG TOLL

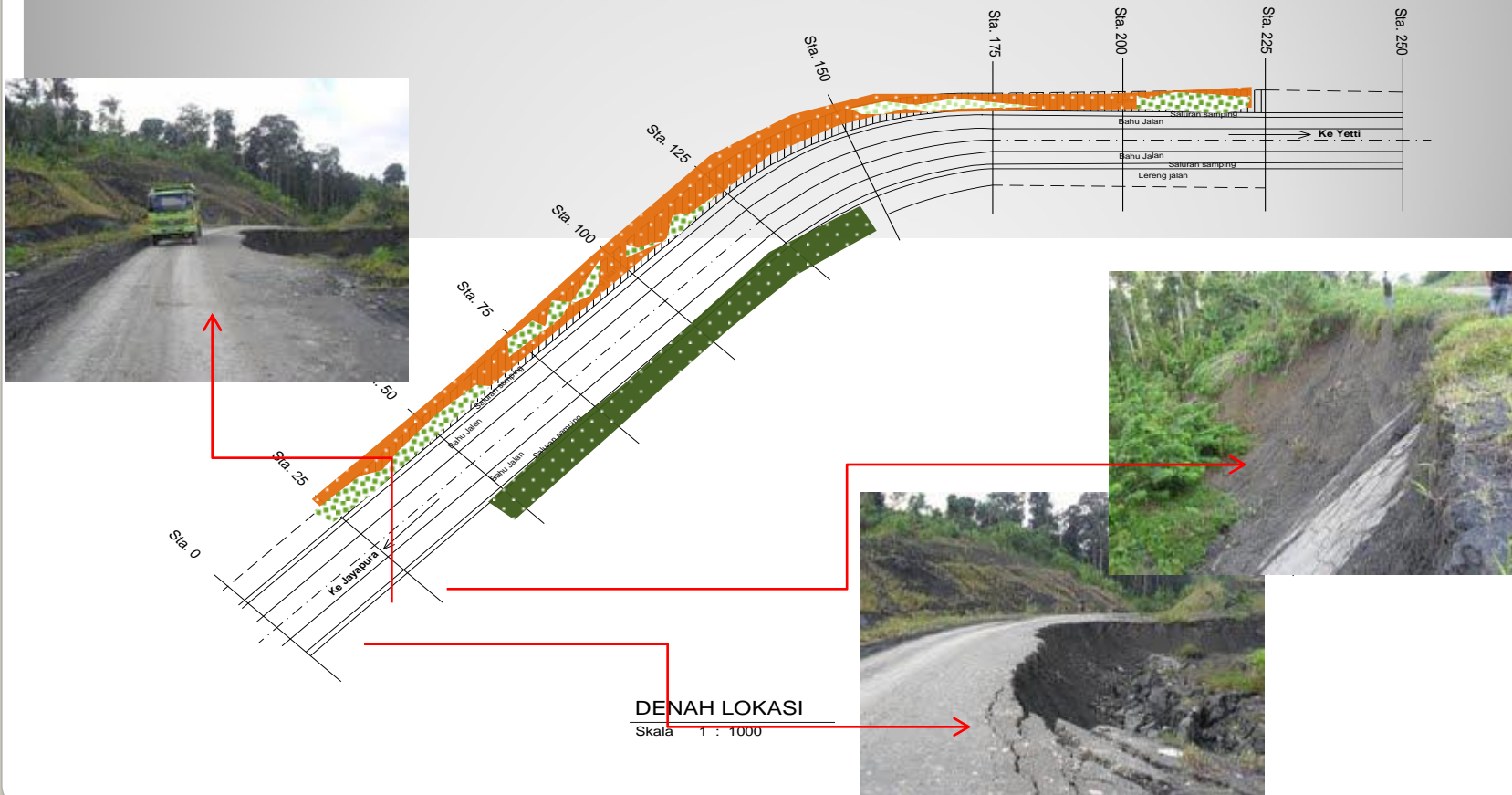


WILD GRASS COMPETED WITH VETIVER

PROBLEMS

LANDSLIDING

AT YETTI – ARSO ROAD SECTION, PAPUA



OTHER PRODUCTS BY IRE

- TRAINING MODULES (NURSERY, IMPLEMENTATION, AND MAINTANANCE OF VETIVER SYSTEM)
- TECHNICAL GUIDELINE ON SURFACE EROSION CONTROL AND SHALLOW FAILURE PREVENTION OF ROAD SLOPE
- DRAFT SPESIFICATION OF IMPLEMENTATION OF VETIVER SYSTEM
- DRAFT SPESIFICATION OF CHARACTERISTIC OF VETIVER GRASS

CONCLUSION

- ❑ VETIVER SYSTEM CAN BE USED EFFECTIVELY TO CONTROL SURFACE EROSION AND SHALLOW FAILURE OF ROAD SLOPE
- ❑ VETIVER SYSTEM CAN BE USED EFFECTIVELY AT SLOPE 30° – 60°
- ❑ VETIVER SYSTEM COULD BE APPLIED BY ROAD AUTHORITIES TO COPE WITH EROSION AND SHALLOW FAILURE OF ROAD SLOPE
- ❑ AT ROAD SLOPE $> 60^{\circ}$, VETIVER TECHNOLOGY IS NOT RECOMMENDED TO APPLIED SOLELY(MUST COMBINED WITH MECHANICAL METHOD)

THANK YOU